#14

**PATENT APPLICATION**

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of :
Kim B. Roberts

Serial No: 09/349,087

Group Art Unit: 2662

Filed: July 8, 1999

Examiner: ODLAND, David E.

For: Mapping Arbitrary Signals into SONET



Assistant Commissioner for Patents
Alexandria, VA 22313-1450

MAIL STOP APPEAL BRIEF -PATENTS

Sir:

**APPELLANT'S BRIEF UNDER 37 C.F.R. § 1.192**

Pursuant to 37 C.F.R. § 1.191, the Applicant submitted a Notice of Appeal from the Examiner to the Board of Patent Appeals and Interferences on April 29, 2004. Specifically, the Applicant takes appeal from the Examiner's rejection of claims 1-10, 21-24 and 26-28 under 35 U.S.C. § 103(a). The Notice of Appeal was filed in response to the Examiner's Final Action (paper No. 13) mailed February 4, 2004 and Advisory Action (paper No. 12) mailed April 12, 2004. Pursuant to 37 C.F.R. § 1.192, the Applicant now submits the following brief.

1) **Real Party in Interest**

The real party of interest is Nortel Networks Limited, by virtue of an assignment executed by the inventors in favour of Nortel Networks Corporation recorded at Reel/Frame ???/???, and a Universal Change of Name from Nortel Networks Corporation to Nortel Networks Limited recorded at Reel 011195/Frame 0706.

2) **Related Appeals and Interferences**

None.

**3) Status of claims**

Pursuant to the Final Action (paper No. 10) mailed February 4, 2004 and the Advisory Action (paper No. 12) mailed April 12, 2004, the status of the claims is as follows:

(a) claims 1-4 stand rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.);

(b) claims 5,21-24,26, 27 and 28 stand rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.) in view of United States Patent No. 5,263,056 (Urbansky);

(c) claims 6-10 stand rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.) in view of United States Patent No. 5,263,056 (Urbansky), and further in view of United States Patent No. 4,998,242 (Upp);

(d) claim 12 stand rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.) in view of United States Patent No. 6,240,087 (Cummings et al.);

(e) claims 13, 16, 17, 19 and 20 stand rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.) in view of United States Patent No. 4,998,242 (Upp);

(f) claims 14 and 15 stand rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.) in view of United States Patent No. 4,998,242 (Upp), and further in view of United States Patent No. 5,131,013 (Choi);

(g) claim 18 stands rejected under 35 USC § 103(a) as being unpatentable over United States Patent No. 6,047,005 (Sherman et al.) in view of United States Patent No. 4,998,242 (Upp), and further in view of United States Patent No. 5,663,820 (Shiragaki); and

(h) claims 11 and 25 are objected to as being dependent on a rejected base claim.

## 4) Status of Amendments

No amendments were submitted in the Applicant's response filed April 5, 2004, to the Final Office Action (paper No. 10) mailed February 4, 2004. Accordingly, the claims remain as amended in the Applicant's response filed on November 3, 2003. A copy of the current claims is provided in the Appendix below.

## 5) Summary of Invention

The present invention is generally directed to methods and systems for transparently transporting data signals having a continuous format through a synchronous transport network. More particularly, the present invention provides methods and systems for mapping arbitrary signals into SONET frames, and subsequently de-mapping data from SONET frames to recover the original data signals.

The general concept of mapping a continuous signal into a SONET frame is not new. For example, although United States Patent No. 6,047,005 (Sherman et al.) is not directed to signal mapping per se, Sherman et al discusses the well know technique of mapping T1 signalling into VT1.5 over OC-3 to enable transport of lower rate T1 signalling over a synchronous network. Many signal mappings of this type are well known, and predate the Sherman et al reference. As is well known in the art, these are fixed-rate mappings that involve the insertion of stuff bits (or words) to compensate differences between the data rates of the customer's data signal and the synchronous transport signal.

As is also well known in the art, and described in the present application, such prior art mappings must necessarily be provisioned by the network service provider as part of connection set-up. Thus, as each link in an end-to-end connection is established, the network service provider uses detailed information concerning the customer's service requirements to assign network resources (including any necessary mappings) to the link, and these resource allocations remain "nailed-up" for the duration of the connection. Once the connection has been established, the network service provider notifies the customer that the connection is ready for use. If the customer subsequently wishes to change their signal format (or data rate), the network service provider is compelled to "tear down" the connection, and establish an entirely new connection with resource allocations and mappings appropriate for the new signal.

The present invention overcomes this limitation by providing an "adaptive mapping algorithm", which enables the mapping function to be rapidly provisioned "on the fly" (see page 6 line 5). This is accomplished by adaptively mapping the data to the frame, using both fixed stuffs and adaptive stuff bits. The number and location of the adaptive stuff bits are dynamically computed based on the (possibly changing) relationship between the customer's continuous format signal and the fixed length container used for transport across the synchronous network. With this arrangement, changes in the customer's signal format (and/or data rate) can be accommodated automatically, without intervention by the network service provider to re-provision or alter the connection in any way.

## 6) Issues

The following issues presented for review by the Board of Patent Appeals and Interferences are as follows:

(a) Whether the Examiner has properly given the claims their "broadest reasonable interpretation consistent with the specification" as required by MPEP. § 2111; and

(b) Whether the Applicant has successfully traversed the Examiner's claim rejections under 35 U.S.C. § 103(a).

## 7) Grouping of Claims

Claims 1-28 are pending in the present application. Of these, claims 1, 13, 19 and 21 are independent claims. All of the issues presented for review can be decided with reference to the independent claims.

## 8) Argument

In order to facilitate review by the Board, the Applicant's arguments are presented in the following order:

- Brief summary of the independent claims
- The Examiner's interpretation of the claim limitations
- The Examiner's claim rejections under 35 U.S.C. § 103(a)

Arguments pertaining to each of these points are presented below under equivalent sub-headings.

(i) Brief Summary of the independent claims

As described above, the present invention defines over prior art mapping methods by providing an adaptive mapping algorithm in which the number and location of adaptive stuff bits are dynamically computed based on the (possibly changing) relationship between the customer's continuous format signal and the fixed length container of the synchronous network. In Applicant's response filed April 5, 2004, the independent claims 1, 13, 19 and 21 were amended to emphasize this adaptive function. Thus, claim 1 reads in part:

> at a transmit site, adaptively distributing the bits of said continuous signal into valid locations of a frame of said container signal and providing stuff bits into invalid locations

Claim 13 reads, in part:

> a mapping unit for extracting said stream of data bits from said receiver buffer unit at a mapping clock rate, and adaptively inserting stuff bits and said data bits into said frame at a block clock rate according to said control function β.

Claim 19 reads in part:

> A de-synchronizer for adaptively reverse mapping a continuous format signal of an arbitrary rate received over a synchronous network as a transparent tributary signal, comprising:
>
> a reverse mapping unit for receiving a frame of said tributary at a block clock rate and a control function β, and extracting a stream of data bits at a mapping clock rate, while excluding stuff bits according to said control function β;

in which the person of ordinary skill in the art will recognise the adaptive functionality of the reverse mapping unit, in which stuff bits are excluded in accordance with the received control function β.

Claim 21 reads in part:

> adaptively mapping said continuous digital signal into said container signal by assigning from a set of assignable locations in said container signal, locations to include adaptive stuff bits, where said set of assignable locations comprises a significant fraction of the locations within said container signal.

(ii) The Examiner's interpretation of the claim limitations

In the Final Office Action (paper No. 10) mailed February 4, 2004, the Examiner asserted (at paragraph 10 of the Examiner's detailed action) that:

> "The term 'adaptively' merely means to suitably perform some function.." (Underlining added)

In the Advisory Action (paper No. 12) mailed April 12, 2004, the Examiner reaffirmed his position in the Final Action by arguing that:

> "... the Applicant argues that Examiner's definition of the term 'adaptively' is correct but does not correspond to the Applicant's intended definition for the term 'adaptively', which is '...that it is performed in a manner that it dynamically adjusts for changes in the format and/or data rate of the contiguous signal, without requiring intervention by the network service provider...' and it provides means to '...enable the mapping function to be rapidly provisioned 'on the fly'. The Examiner respectfully disagrees. This definition of the term 'adaptively' upon which applicant relies is not recited in the rejected claims..."

The Examiner's assertion with respect to the applicant's arguments presented in Applicant's response filed April 5, 2004 is patently false. In particular, page 3 of Applicant's response filed April 5, 2004 reads:

> "... the Examiner states that "the term 'adaptively' merely means to suitably perform some function". This is incorrect. " (Underlining added)

Thus Applicant's response filed April 5, 2004 clearly rejected the Examiner's definition of the term "adaptively". The same passage of Applicant's response continues:

> "... In fact, the term "adaptively" as used in the present specification, and the amended claims, is a common term of art which means that the function is performed in such a way that it dynamically adjusts to changes in one or more parameters."

Thus the Applicant unambiguously stated that "the term "adaptively" ... is a common term of art...". As such, applicant is not attempting to rely upon a special definition of a term, such as might require that the definition be included in the rejected claims. Rather, Applicant is using a common term of art in the manner accepted in the art, with the expectation that Examiner will apply this meaning to the interpretation of the claim limitations.

However, in the Advisory Action (paper No. 12) mailed April 12, 2004, the Examiner maintained his earlier misinterpretation of the claim limitations, stating that

> "...the Examiner is required to read claim limitations in the broadest sense and in this case the Examiner's interpretation of the term 'adaptively' (i.e. a means to suitably perform some function), is taught by Sherman." (underlining added)

In fact, the permissible scope of claim interpretation is somewhat more restricted than that appropriated by the Examiner. MPEP. § 2111 clearly states that "... the pending claims must be 'given their broadest reasonable interpretation consistent with the specification.' *In re Hyatt*, 211 F.3d 1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000). In either case, the Examiner's interpretation of the term "adaptively" as meaning "to suitably perform some function" represents neither the a reading of the claims limitations in their broadest sense, as suggested by the Examiner, nor the broadest reasonable interpretation consistent with the specification, required by MPEP § 2111. Instead, the Examiner has replaced an accepted term of art (i.e. adaptively – meaning that the function dynamically adjusts to changes in some parameter) appearing in the claims with a term of patent jargon (i.e. adapted – meaning to

suitably perform some function). In effect, the Examiner has rewritten the above-quoted portion of claim 1 to read:

> at a transmit site, suitably distributing the bits of said continuous signal into valid locations of a frame of said container signal and providing stuff bits into invalid locations

The person of ordinary skill in the art will immediately recognise that the Examiner's rewritten claim limitation is in no way equivalent to the claim limitation presented by the applicant. Furthermore, the skilled artisan will immediately appreciate that the difference is not merely a matter of broadly reading the term "adaptively". As detailed above and in Applicant's response filed April 5, 2004, the term "adaptively" is a common term of art with a well understood meaning, which in its broadest reasonable interpretation necessarily includes that "the function is performed in such a way that it dynamically adjusts to changes in one or more parameters." The term "adaptively" (and its counterpart "adaptive") is used throughout the specification and claims in a manner that is uniformly consistent with this meaning.

In the Advisory Action (paper No. 12) mailed April 12, 2004, the Examiner points out that:

> "Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See In re Van Geuns, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993)"

However, no such importation of limitations from the specification is being relied upon by the Applicant. The term "adaptively" (and its counterpart, "adaptive") is a well known term of art, with a meaning that is well accepted and understood to those of ordinary skill in the art. As such, Applicant is not seeking to rely on a unique or unusual definition, such as might require inclusion of the applicant's definition in the claim. Rather, Applicant is using an accepted term of art in the conventional manner. It merely remains for the Examiner to read the claim language as it is presented, using the accepted meanings for the terms therein.

(iii) The Examiner's claim rejections under 35 U.S.C. § 103(a )

The Examiner's rejection of claims 1-10, 21-24 and 26-28 under 35 U.S.C. § 103(a) are premised on the Examiner's assertion that United States Patent No. 6,047,005 (Sherman et al.) teaches a method and system in which a continuous format signal is mapped to a container of a synchronous network, and that this teaching falls with the Examiner's meaning of the term "adaptively".

However, as detailed above, the Examiner's interpretation of the claim limitations is unfounded and invalid. The broadest interpretation of the claim limitations that is reasonable and consistent with the specification must necessarily include that the function is performed in such a way that it adjusts to changes in some parameter.

As argued in Applicant's response filed November 3, 2003, Sherman et al is directed toward solving the problem of wasted bandwidth due to under utilization of outbound T1 circuits of a voice response unit (see columns 1 and 2) and is not directed toward solving the problems of the present invention, namely mapping of an arbitrary rate signal. Sherman et al do not teach, suggest, or even remotely contemplate a system capable of adaptively mapping a continuous format signal to a container of the synchronous network. More particularly, Sherman et al do not teach of suggest "adaptively distributing the bits of said continuous signal into valid locations of a frame..." as required by claim 1. Nor, for that matter, do they have any reason to, because Sherman et al are directed to solving a completely different problem.

None of the cited references supply the missing teaching, for at least the reason that none teach or suggest an "adaptive" mapping function.

In light of the foregoing, it is submitted that the applicant has fully traversed the Examiner's rejection of claims 1-10, 21-24 and 26-28 under 35 U.S.C. § 103(a).

**9) Appendix**

Claims involved in the Appeal

1. (previously amended) A method for transmitting a continuous digital signal of an arbitrary rate R1 over a synchronous network, comprising:

selecting a fixed length container signal of a rate R, where R is higher than said arbitrary rate R1 of said continuous signal; and

at a transmit site, adaptively distributing the bits of said continuous signal into valid locations of a frame of said container signal and providing stuff bits into invalid locations,

wherein said invalid locations are uniformly interspersed across said frame.

2. (original) A method as claimed in claim 1, wherein said container signal is a SONET/SDH signal, and said synchronous network is a SONET/SDH network.

3. (previously amended) A method as claimed in claim 2, wherein said continuous digital signal is also a SONET/SDH signal.

4. (original) A method as claimed in claim 2, wherein said SONET/SDH signal comprises a plurality of transparent tributaries.

5. (previously amended) A method as claimed in claim 1, wherein said stuff bits comprises fixed stuff and adaptive stuff bits.

6. (previously amended) A method as claimed in claim 5, wherein said step of adaptively distributing comprises:

determining the phase difference between said continuous digital signal and said container signal;

adaptively adding to the bits of said continuous digital signal including a definite number of locations for accommodating said fixed stuff bits within said frame, and an adjustable number of locations for accommodating said adaptive stuff bits within said frame, based on said phase difference.

7. (previously amended) A method as claimed in claim 6, wherein said adjustable number is significantly larger than said definite number.

8. (previously amended) A method as claimed in claim 6, wherein said definite number includes transport overhead (TOH) locations and remainder fixed stuff bits locations.

9. (previously amended) A method as claimed in claim 8, further comprising providing maintenance, operation, administration and provisioning information in said TOH locations.

10. (previously amended) A method as claimed in claim 6, wherein said step of adaptively adding comprises:

partitioning said frame into a number of equally sized data blocks and said definite number of locations;

for each block,

determining a control function $\beta$ indicative of said adjustable number; and

mapping said adaptive stuff bits based on said control function.

11. (previously amended) A method as claimed in claim 10, wherein said step of mapping comprises:

providing a counter C for identifying a location in said block;

defining the binary bit reversal $\alpha$ of said control function $\beta$;

calculating the bitwise transition delta of said counter C; and

determining if a location identified by said counter C is an invalid location, whenever a function Valid $(C,\beta)$ is false; and

providing an adaptive stuff bit into said invalid location.

12. (previously amended) A method as claimed in claim 1, further comprising recovering said continuous signal from said synchronous signal at a receive site, by extracting the data bits of said continuous signal from said valid locations of said frame.

13. (previously amended) A synchronizer for adaptively mapping a continuous format signal of an arbitrary rate for transport over a synchronous network, comprising:

a data recovery unit for recovering from said continuous format signal, a stream of data bits and a data clock indicative of said arbitrary rate;

a receiver buffer unit for receiving said stream of data bits, determining a phase difference between said arbitrary rate and the rate of a frame of said tributary, and generating a control function $\beta$;

a mapping unit for extracting said stream of data bits from said receiver buffer unit at a mapping clock rate, and adaptively inserting stuff bits and said data bits into said frame at a block clock rate according to said control function $\beta$.

14. (previously amended) A synchronizer as claimed in claim 13, wherein said receiver buffer unit comprises:

an elastic store for temporarily storing an amount of data bits of said stream at said data rate clock and providing said data bits to said mapping unit at said block clock rate;

a digital PLL for determining the phase difference between said arbitrary rate and said mapping clock and providing said control function $\beta$.

15. (original) A synchronizer as claimed in claim 13, wherein said data recovery unit comprises a frequency agile PLL for detecting said arbitrary rate, and a receiver for detecting said data bits using said data clock.

16. (previously amended) A synchronizer as claimed in claim 13, wherein said mapping unit comprises:

a block clock gapper for receiving a clock indicative of the rate of said synchronous frame and providing said block clock of a block rate accounting for all locations of said synchronous frame and with gaps accounting for a definite number of locations for accommodating fixed stuff bits;

a mapping clock gapper for receiving said block clock and said control signal $\beta$ and providing a mapping clock of a mapping rate accounting for all locations of said synchronous

frame and with gaps accounting for an adjustable number of locations for accommodating adaptive stuff bits within said frame; and

a mapper for receiving said block clock and said mapping clock and accordingly mapping said stream of data bits in said frame.

17. (currently amended) A synchronizer as claimed in claim 13, further comprising a receiver OH FIFO for arranging a plurality of transport overhead TOH locations for seamless transport of said frame within said synchronous network.

18. (previously amended) A synchronizer as claimed in claim 17, further comprising an overhead multiplexer for adding operation, administration, maintenance and provisioning data into said TOH locations.

19. (previously amended) A de-synchronizer for adaptively reverse mapping a continuous format signal of an arbitrary rate received over a synchronous network as a transparent tributary signal, comprising:

a reverse mapping unit for receiving a frame of said tributary at a block clock rate and a control function β, and extracting a stream of data bits at a mapping clock rate, while excluding stuff bits according to said control function β;

a transmitter buffer unit for receiving said data bits, and determining a phase difference between said arbitrary rate and the rate of said frame; and

a data transmit unit for receiving said data bits and transmitting said continuous format signal at a data rate controlled by said phase difference.

20. (original) A de-synchronizer as claimed in claim 19, wherein said control function β is received in said frame.

21. (previously amended) A method for transmitting a continuous digital signal of a rate R1 over a synchronous network comprising:

selecting a container of a rate R, where R is higher than said rate R1 of said continuous signal; and

adaptively mapping said continuous digital signal into said container signal by assigning from a set of assignable locations in said container signal, locations to include adaptive stuff bits, where said set of assignable locations comprises a significant fraction of the locations within said container signal.

22. (original) A method as claimed in claim 21, where the location and the number of stuff bits assigned depends on the phase of said continuous digital signal.

23. (previously amended) A method as claimed in claim 22, wherein said step of adaptively mapping comprises:

assigning a definite number of locations as fixed stuff bits within a frame of said container signal, and an adjustable number of locations as said locations to include adaptive stuff bits within said frame.

24. (original) A method as claimed in claim 23, wherein said step of adding comprises:

partitioning said frame into a number of equally sized data blocks of said definite number of locations;

for each data block,

determining a control function $\beta$ indicative of said adjustable number; and

mapping data bits and said adaptive stuff bits within the block based on said control function.

25. (original) A method as claimed in claim 24, wherein said step of mapping comprises:

providing a counter C for identifying a location in said block;

defining the binary reversal $\alpha$ of said control function $\beta$;

calculating the bitwise transition delta of said counter C; and

determining if a location identified by said counter C is an invalid location, whenever a function Valid(C, $\beta$) is false; and

providing an adaptive stuff bit into said invalid location.

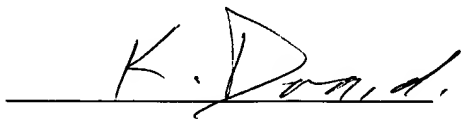
26. (original) A method as claimed in claim 23, further comprising recovering said continuous signal from said synchronous signal at a receive site, by extracting the data bits of said continuous signal from said frame.

27. (original) A method as claimed in claim 24, wherein said phase is communicated to a far end receiver and wherein said far end receiver uses said phase to recover said continuous signal from said synchronous signal by extracting the data bits of said continuous signal from said frame.

28. (original) A method as claimed in claim 21, wherein said continuous signal is a SONET/SDH signal, said container signal is a SONET/SDH signal, and said synchronous network is a SONET/SDH network.

If any extension of time under 37 C.F.R. § 1,136 is required to obtain entry of this brief, such extension is hereby respectfully requested. If there are any fees due under 37 C.F.R. §§ 1.16 or 1.17 which are not enclosed herewith, including any fees required for an extension of time under 37 C.F.R. § 1.136, please charge such fees to our Deposit Account No. 19-5113.

Respectfully submitted,



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